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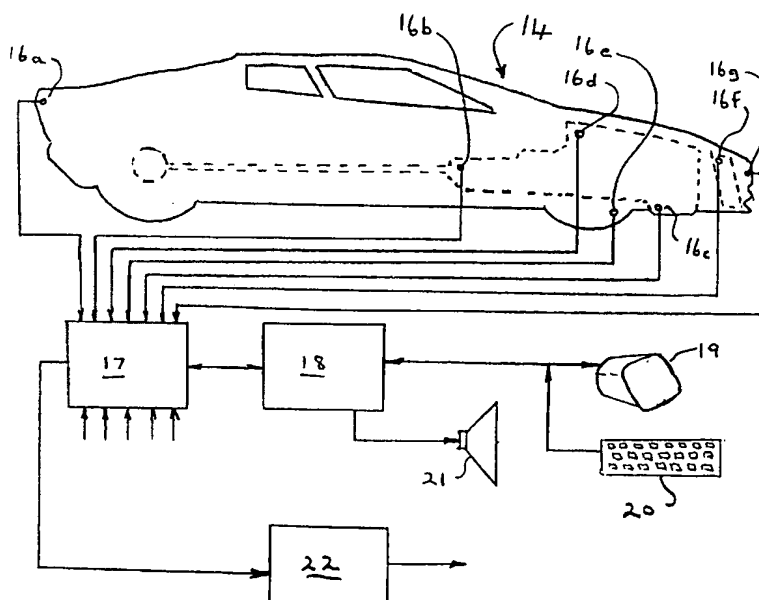
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>B60K 35/00, G01M 17/00, B60R 25/00,</b> <b>B60Q 5/00, B60S 5/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/28145</b> <b>(43) International Publication Date:</b> 10 June 1999 (10.06.99)
<b>(21) International Application Number:</b> PCT/AU98/01003 <b>(22) International Filing Date:</b> 3 December 1998 (03.12.98) <b>(30) Priority Data:</b> PP 0730 3 December 1997 (03.12.97) AU <b>(71) Applicant (for all designated States except US):</b> AUSTRALIAN ARROW PTY. LTD. [AU/AU]; 65 Lathams Road, Carrum Downs, VIC 3201 (AU). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> JAMES, Campbell, Richard [AU/AU]; 109 Grant Road, Mt Eliza, VIC 3930 (AU). <b>(74) Agent:</b> CARTER SMITH & BEADLE; 2 Railway Parade, P.O. Box 557, Camberwell, VIC 3124 (AU).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>

(54) Title: VEHICLE ASSISTANCE SYSTEM



## (57) Abstract

An on-board vehicle information system includes a plurality of sensors (16) which sense, measure or detect various vehicle operating parameters and generate a signal which is received by a receiver (17). The receiver (17) collects the sensor signals to an information storage and retrieval unit (18) which generates a communication output relating to the received signals. The output can be displayed by a screen (19) and heard through a speaker (21). The storage and retrieval unit (18) may be interrogated, such as through a keyboard (20) to provide additional desired information.

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## VEHICLE ASSISTANCE SYSTEM

### Field of the Invention

This invention relates to a system for assisting drivers and owners of vehicles, such as automobiles, commercial vehicle and trucks or lorries, and relates particularly to a system which will assist a person in the event of an occurrence of a relatively minor fault in the vehicle or to enable a person to understand vehicle equipment operation.

Motor vehicles have become relatively complicated items of equipment requiring owners and drivers to learn and understand a large number of operational and maintenance functions. These can range from using a jack to change a wheel to topping up fluids such as windscreen washer fluid, coolant, brake fluid and power steering fluid reservoirs, to changing light bulbs. In addition, drivers and owners need to be aware of various warning systems and indicators which can provide information in relation to the vehicle operation.

### Background of the Invention

At the present time, most motor vehicles are fitted with sensors and visual and/or audible warning devices, such as warning lights or gauges, to advise a driver in the event of certain faults, such as high water temperature, low oil pressure, headlight or taillight malfunction or the like. While warning lights and other indicators can provide certain information to a vehicle driver, they may also lead to inappropriate responses by the driver, including simply ignoring the warning signal. Often, a driver will ignore a warning signal or a gauge reading due to ignorance or lack of immediate information as to the nature of the problem and its effect and resolution. This can lead to unnecessary damage occurring where the warning shows, for example, no oil pressure or, conversely, to an unnecessary service call where only a minor problem, such as low windscreen washer water level, has occurred.

More recently, and with increasing electronic content in vehicles, more and more sensors are being fitted to vehicles to detect and record vehicle engine and

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equipment operating conditions and parameters. At present, many of these sensors and associated data are accessible only by service centers with complicated and expensive diagnostic equipment.

Some vehicles, particularly sophisticated racing vehicles, incorporate  
5 computer systems and telemetry systems to communicate information concerning vehicle operation to a central location at which the information can be assessed. Such systems are impractical for the ordinary motorist and commercial vehicle operator.

Most new motor vehicles are supplied with an owners manual which  
10 describes various features and functions of the vehicle and provides information for a driver. However, assimilation of that information is virtually impossible without thorough and continuous reference to the manual and drivers, therefore, are prone to forget the operation of many of the features incorporated in the motor vehicle.

15

### **Summary of the Invention**

It is therefore desirable to provide a system whereby a driver, owner or other person is provided with information concerning a given warning signal.

It is also desirable to provide a system which notifies the driver of a vehicle  
20 in the event of a fault, malfunction or the occurrence of an event and which provides further information concerning the nature of the fault, etc and an appropriate course of remedial or other action to be followed by the driver.

It is also desirable to provide a system for warning a driver when it becomes dangerous or inappropriate to continue driving the vehicle in the event of a major  
25 fault.

It is also desirable to provide a warning system for a vehicle which is relatively simple and economical to manufacture and install.

It is also desirable to provide information concerning the operation of a motor vehicle, its systems and equipment in the form of audible information or  
30 instructions and which is easily accessible by the vehicle driver, owner or other person.

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According to one aspect of the invention there is provided an information system for a vehicle to indicate information relating to the occurrence of a fault or other information relating to operation of the vehicle or other operating parameters of which a driver or the other person needs or wishes to be aware, said system including a plurality of sensors located throughout the vehicle, receiving means receiving signals from said sensors, information storage and retrieval means storing reference data relating to received signals, and communication means to provide information retrieved from the storage and retrieval means relating to the received signals.

10 Preferably, the communication means includes a display comprising a touch screen display or display with programmable function keys located in the vehicle whereby the driver may interrogate the information storage and retrieval means for desired information.

It is also preferred that if a sensor senses the occurrence of a fault or senses a predetermined condition, a signal is transmitted to the receiving means which initiates retrieval of information relating to that signal from the reference data stored in the storage and retrieval means. Information relating to the fault or condition is then displayed on the display means, preferably with a recommended course of action. Audible means may also be used in conjunction with the display means to provide either an audible warning sound, synthesized voice statements or the like.

In one preferred form of the invention, the information storage and retrieval means includes an interactive computer system with information storage media, such as a solidstate memory or remotely located computer hard disk drive or CD ROM drive in a computer accessed by a cellular phone or similar link. The computer is programmed so that, when a signal is received from one or more of the vehicle sensors, the event or condition represented by that signal gives rise to a visual display of appropriate information on a display screen and, if appropriate, gives rise also to an audible warning. If necessary, the vehicle driver is then able to interrogate the computer system in relation to the indicated information to either

ascertain further information concerning the signal or to obtain information concerning any necessary remedial action which needs to be taken.

In order that the invention is more readily understood, one embodiment thereof will now be described with reference to the accompanying drawings.

5        Figure 1 is a schematic illustration of an information system for a vehicle in accordance with one embodiment of the invention.

Referring to the drawing, a vehicle 14 is provided with a plurality of sensors 16 of which seven (7) are shown as 16a-16g. Such sensors are commonly used in vehicles and will not be described in detail. The particular sensors illustrated for  
10       the purposes of this description are:

16a - tail light bulb failure sensor; this sensor detects if any of the electric bulbs in the tail light assemblies fails;

16b - transmission temperature sensor; this measures the temperature of the transmission fluid or oil to provide a warning if the temperature becomes too high  
15       as a result of a problem in the transmission system;

16c - oil pressure sensor; this sensor senses the engine oil pressure. The output from this sensor can be used for a variety of purposes, but most importantly provides a warning if the engine oil pressure drops below a minimum predetermined pressure indicating an oil pressure problem;

20       16d - cam shaft sensor; this sensor is used in conjunction with the engine management system to measure the cam shaft rotational position. Variation of that position in conjunction with engine speed, selected gear, accelerator position, engine temperature and other parameters enables the engine management system to optimize the cam shaft rotational position;

25       16e - tyre pressure sensor; a sensor is provided in conjunction with each vehicle tyre to detect low or abnormally high tyre pressures;

16f - coolant level/temperature sensor; the condition of engine coolant is monitored so as to be able to provide a warning if the temperature becomes too high;



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16g – head light bulb failure sensor; this operates in a similar manner to the tail light this sensor detects if any of the electric bulbs in the tail light assemblies fails.

The sensors 16 and other sensors not shown are connected either directly or by means of a data bus not shown to receiver 17 which communicates with a data storage retrieval unit 18. The unit 18 is preprogrammed with data relating to possible faults and remedies associated with each of the vehicle components for which the sensors 16 are provided. The signals from receiver 17 are analysed by the unit 18 to produce a pre-programmed output in response to the data generated by the individual sensors. The output response is determined by the preprogrammed information in the data storage and retrieval unit 18 so that an appropriate audio and visual output is generated.

The storage and retrieval unit 18 is connected to a display 19, preferably a touch screen display, and, if desired, to an audio speaker or transducer 21. The storage and retrieval unit 18 receives a signal from the receiver 17 appropriate to a particular sensor which has been actuated or to a particular range of sensor signal output and computes in conjunction with the stored data an output message to be displayed on the display screen 19. If appropriate or desirable, an audible warning sound or voice message may also be initiated to draw the attention of the vehicle driver to the message or warning.

In some instances the displayed message will be one which, as well as indicating the warning or fault, also provide one or more recommendations for action appropriate to the warning or fault. Thus, the "coolant level/temperature" sensor 16f might produce a warning message "Low coolant level" and a remedy suggestion of "Check coolant level". In the case of the display 19 being a touch screen display, the warning message on the screen may be followed by a question "do you require a suggested remedy". The remedy, therefore, then appears only after the touch screen has been activated to display one or more appropriate remedies. The display may also provide an indication of the relative importance or severity of the displayed message. Thus, a "low oil pressure" warning may be considered to be "moderate to urgent" but if that warning is supplemented by, for

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example, "high coolant temperature" the message importance would be classified as "very urgent".

The amount of information provided may also be selected by the driver using a touch screen display. The system may be interrogated by the driver using the touch screen to obtain superficial, in depth and detailed information, depending on the level of expertise of the driver and the need or desirability for such detailed information. Naturally, the data storage and retrieval unit 18 may also work in conjunction with an on board vehicle computer which computes services intervals, fuel consumption, trip distances and the like. Such information can also be used in conjunction with the storage and retrieval unit 18 to enhance the information provided to the vehicle driver or owner.

Several layers of fault diagnosis and recommendations may be programmed into the storage and retrieval unit 18 and accessible by the vehicle driver through the touch screen. Thus, the unit 18 may be interrogated by the driver in relation to any particular fault or warning so that multiple tests, checks or remedial actions can be displayed on the screen display 19. Thus, it may provide instructions to locate and fill the coolant header bottle, what additives to use, and the like. It will be appreciated that, if remedial action is required, the system is able to link the detected fault with other available vehicle condition information so as to retrieve relevant reference data for display on the screen. Such data may include diagrams and/or text descriptions of steps recommended to correct a fault or to remedy a warning. Such steps may be as simple as "Replace right rear tail light globe" to warnings advising impending major engine failures and the like. Having access to sensor information the system can also work interactively with the driver by prompting the driver to take a specific action and sense the outcome. This can then be used by the system in further diagnosis of the problem as well as to confirm the problem has been resolved.

The storage and retrieval unit 18 may also be provided with information which is ordinarily provided in the standard vehicle owner operating and maintenance manual, containing instructions for an owner/driver in the vehicle operation, including location of jacking points, operation of CD player, correct tyre

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pressures, and like information. Thus, the system of the invention may be used to totally replace an Owner's Handbook which are commonly provided with motor vehicles. A keyboard 20 may be provided to facilitate access to the stored information.

- 5           The system of the invention may also be used in conjunction with a service center diagnostic system to provide for more advanced vehicle diagnostic information.

- It will be understood that the system of the invention, as well as being able to replace an Owner's Manual, provides automatic indexing and an advanced fault  
10       diagnostic system which can present to the driver a clear course of action in the event that a warning or fault occurs. Such a system will reduce the chance of inappropriate action being taken by a driver, may act to reduce service costs arising from inappropriate action causing damage, and will improve a driver's confidence of being able to act appropriately in abnormal circumstances.

- 15           It will also be appreciated that any appropriate information may be included in the storage and retrieval unit 18 which can be manually accessed by the driver who is able to interrogate the stored data through the touch screen display 19 using appropriate menu functions through the keyboard 20.

**CLAIMS**

1. Vehicle information system for recognising predetermined vehicle operational parameters, said system including a plurality of sensor means located at predetermined positions, each sensor means being adapted to generate a signal  
5 indicative of a functional condition of a vehicle component or operational condition, receiving means receiving said signals from said sensor means, information storage and retrieval means storing reference data relating to received signals, and communication means to provide information retrieved from the storage and retrieval means relating to the received signals.
- 10 2. A system according to claim 1 wherein said communication means includes a display screen to display predetermined messages in response to various signals.
3. A system according to claim 1 or claim 2 wherein said communication means includes audio means.
4. A system according to any one of claims 1 to 3 wherein said storage and  
15 retrieval means is preprogrammed to generate communication information which relates to a signal from a sensor means and which is able to be integrated to provide additional information.
5. A system according to any one of the preceding claims wherein said receiving means polls at least some of said sensors.
- 20 6. A system according to any one of the preceding claims and further including input means associated with said storage and retrieval means to generate input signals adapted to address the storage and retrieval means to extract additional information.
7. A system according to claim 6 wherein said input means comprises a touch  
25 screen display.
8. A system according to claim 6 wherein said input means comprises a keyboard.
9. A system according to claim 6 wherein said input means is a voice actuated signal generation.
- 30 10. A system according to any one of the preceding claims wherein said storage and retrieval means is preprogrammed with information relating to vehicle

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operation, service, maintenance, emergency procedures, contact telephone details, or any one or any combination thereof which information is accessible through the communication means.

11. A system according to any of claims 1 to 9 wherein said storage means is a  
5 remote computer system programmed with information relating to vehicle operation, service maintenance, emergency procedures, contact details or any one or any combination thereof which information is accessible through the communication means via a telecommunication device such as a mobile telephone.

12. A system according to any of the preceding claims wherein said audio  
10 means includes a voice synthesizer which when actuated, gives verbal information or instructions relating to or corresponding to said information.

13. A vehicle information system substantially as hereinbefore described with reference to the accompanying drawing.

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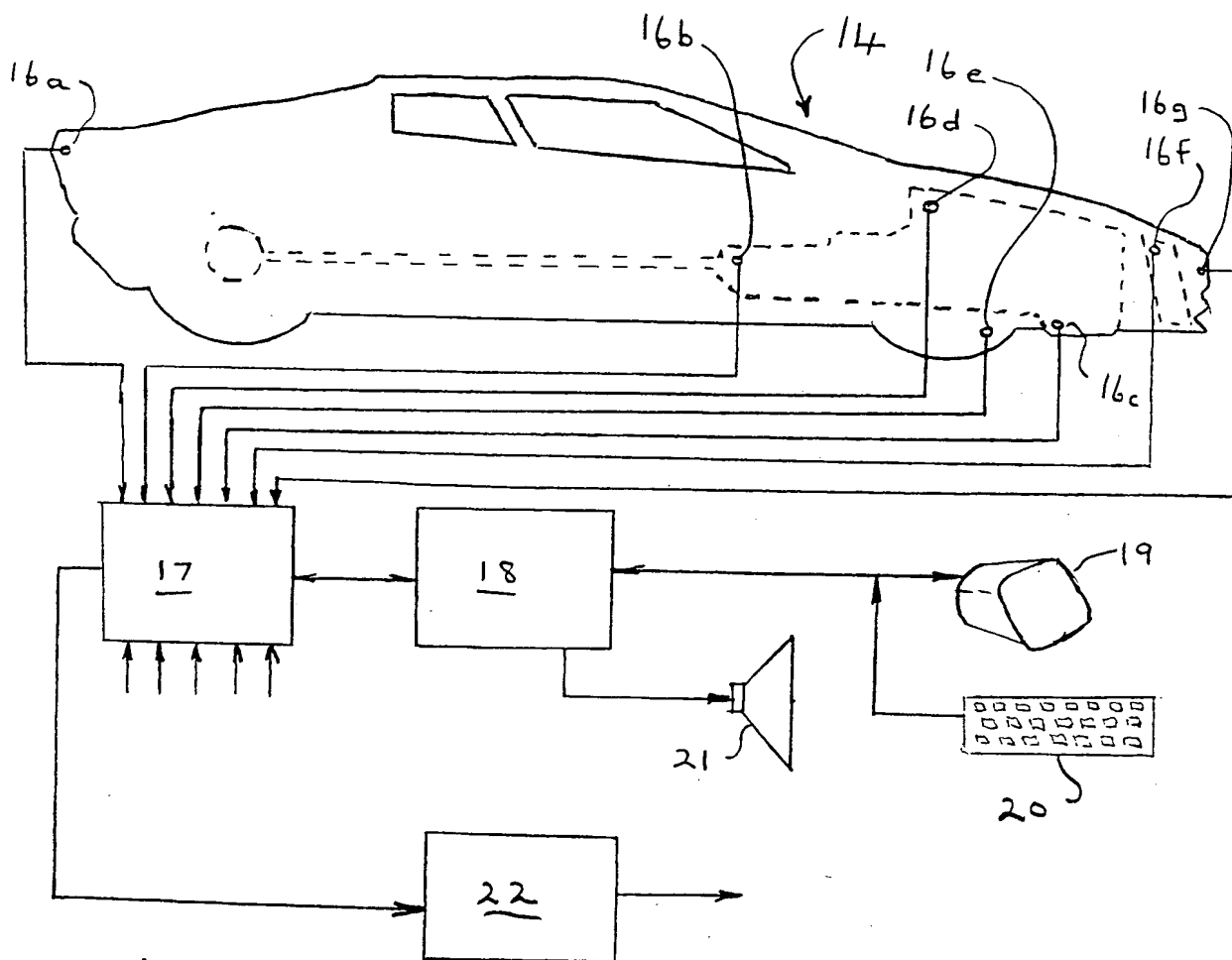


Fig 1

# INTERNATIONAL SEARCH REPORT

International application No.  
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
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X	WO 9304353 A1 (CRANE), 4 March 1993 Whole document	1-6, 8, 10-11																				
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU 98/01003

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4348653 A (TSUZUKI et al.), 7 September 1982 Whole document	1-5, 10, 12
X	US 4310825 A (TSUNODA et al.), 12 January 1982 Whole document	1, 3-5, 10, 12
X	AU 36621/95 (671578) B (LAI), 29 August 1996 Whole document	1, 3-4, 10



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Patent Document Cited in Search Report				Patent Family Member			
US	4348653	EP	36755	JP	56135337		
US	4310825	DE	3040225	FR	2468169	GB	2062921
WO	9304353	AU	25014/92	US	5257190	US	5450321
AU	36621/95	FR	2741576	GB	2307323	AU	75758/96
		EP	863896	WO	9717340		
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